— Dr. M. J. Roberts of New York, after drilling holes in bone to investigate the existence of diseased conditions, introduces a small incandescent lamp of half-candle power into the opening, and by this means illuminates the cavity.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The source of the Mississippi.

The recent discussion, in your columns and elsewhere, of the sources of the Mississippi River, must have suggested to many of your readers the thought that this is an especially fitting time to supplement and complete the work of the early explorers and the government surveyors by a careful examination of the Itasca basin in the light of all previous explorations. There are certain elements in the region that are permanent, and certain others that are temporary and will soon undergo the changes which accompany the settlement and subjection of the wilderness. The Lake Itasca of Schoolcraft and Nicollet, in the main, survives to the present day. A few years more will see many of its features changed past recognition.

If such an exploration is worth the making, it should not be long delayed; and that it is well worth making, the interest of the public already enlisted in this discussion clearly proves. Further, the fact that a mere adventurer and charlatan has been able to lead astray and befog the press and the scientific bodies of almost the entire country, east and west, is no small proof that it is desirable to settle, once for all, the questions at issue.

We have taken this view of the case ever since Captain Glazier's friends first presented his claims for our consideration. The matter was fully investigated by the head of our editorial department, and we became satisfied that nothing short of a thorough exploration of the region in question would satisfy us as educational publishers or justify us in making any changes in our geographical publications. We believe that we, as publishers of geographies and atlases which are widely used and approved, owe this much of service to the public. We therefore some weeks ago arranged to dispatch a competent exploring party to Lake Itasca, fully equipped with instruments for the complete survey and delineation of the region which supplies the feeders of the lake.

The first letters from this expedition are at hand, and consist of a general statement of the character of the work accomplished. The detailed report we expect will be forwarded to us in the course of a week or two, when we shall be glad to place them at the service of your readers as soon as the proper maps can be drawn and engraved. The following extracts from a letter before us shows the nature of the work accomplished: —

"Every stream flowing into Lake Itasca and Elk Lake was followed to its source and located. The area drained by each stream was found, as well as the volume of water discharged. The heights of land were located and elevations taken, as well as the elevation of the sources of all the streams flowing into both lakes."

We have also received by express specimens of the water from both lakes, and a number of small evergreen trees taken from Schoolcraft Island and from various points on the shores of Itasca.

Our instructions were that the exploration be made so thorough as to satisfy every inquiry, and we believe that it has so been made.

Ivison, Blakeman, Taylor & Co.

New York, Nov. 3.

On the figures illustrating zoological literature.

In the course of some remarks on the figures illustrating zoölogical literature in *Science* for Oct. 29, Dr. R. W. Shufeldt justly pleads that proper credit be given to original authors of zoölogical illustrations; but in the course of his remarks he occupies considerable space in accusing me of carelessness in such matters, in the case of my 'Zoölogy' and 'First lessons in zoölogy.' I am charged with making 'a very shiftless acknowledgment of some of the authorities for the illustrations.' I am surprised at this reckless statement, as I intended to, and think I did, make full, proper, and circumstantial acknowledgment of the authorities and works from which most of the cuts were borrowed. Over two-thirds of a page of the preface is devoted to such acknowledgment, and a paragraph is given to the names of standard authors and their works. I regret to learn that two sketches drawn by Dr. Shufeldt himself were not credited. The mistake can easily be corrected in a second edition. I have prided myself on giving proper credit, on this and other occasions, to other naturalists and authors, and to those who have in other ways been of assistance.

Now, let us see if Dr. Shufeldt has been as careful, exact, and guarded as a critic should be. He lectures me for not, in my larger 'Zoölogy,' giving credit to the original artist as well as the author of the book who borrowed the figure. If Dr. Shufeldt had carefully looked through the larger 'Zoölogy,' he would have found that I had done so in the case of twenty figures (figs. 63, 75, 109, 141, 232, 279, 280, 284, 386[6], 387, 394, 434, 437, 457, 460, 461, 491, 500, 515, 516). Now, is this fair, candid criticism? Do not Dr. Shufeldt's sweeping statements, like those of another critic of the 'First lessons,' mislead the reader? Is such carelessness just to the author of the book?

Again: Dr. Shufeldt states that at least fourteen of the cuts from either Audubon or Wilson are accredited to Coues's 'Key.' This statement is based on an inspection of the first edition of the 'Zoölogy:' in the third and later editions, thirteen of these figures are credited to Tenney's 'Zoölogy.' Our critic should refer to the latest edition of the work with which he finds fault. It has certainly, however, been my wish to credit the figures borrowed to the original artist. It is not alway easy to do so in copying from foreign works: in the case of Audubon and Wilson it could have been done, and may be in a later edition.

Coming to the 'First lessons in zoölogy,' Dr. Shufeldt charges me with ignoring the artists in a large number of figures. In the preface I say, "Of the 265 woodcuts, 111 have not appeared in the author's other books." Subtracting 111 from 265, leaves 154 figures. The sources of these are acknowledged in my two larger books; i.e., the 'Zoölogy,' and the 'Briefer zoölogy.' It seemed to me unnecessary to make the acknowledgment again in a smaller book designed for younger pupils. If this was an error, it was not from an intention to mislead. Leaving out the 154 figures previously acknowledged, then taking into account over 100 fully acknowledged, it would be easy for the critical reader to detect the eight figures

drawn by the author. Is Dr. Shufeldt's insinuation a manly one, that I would leave the students to "choose from among the most trustworthy and best of the unacknowledged ones these eight, and accredit the author with them"?

The figures after Morse, Riley, Coues, Hornaday, Rymer Jones, Owen, 'and many others,' are among the 154 previously acknowledged in my other two earlier books.

To further illustrate Dr. Shufeldt's reckless manner of writing: he remarks that fig. 212, after Graber, "looks to my mind far more like the claw of a young lobster than the head of a cockatoo." The figure is a diagram sufficiently well drawn to answer the purpose intended.

One who did not have the book before him would naturally infer, from Dr. Shufeldt's statement, that the skeleton of the wild ass was the only mammalian skeleton figured, whereas there are illustrations of those of the cow, whale, cat, bat, and walrus, with sketches of the limbs and skulls of other forms.

There are other reckless charges of 'carelessness' which seem undeserved. The 'First lessons' was not hastily written. Spare time during a period of over two years was given to its preparation. The manuscript was read, revised, and reread; some chapters were read over several times; it was also read aloud to two children of fourteen and seventeen years, to make sure that it should be intelligible. The borrowed illustrations were chosen with care: they are necessarily uneven in character, where drawn by artists of unequal ability, and copied from authors of varying merit.

In closing let me say that I believe in searching, sharp criticism of text and illustrations; it tends to greater care and accuracy: but let it be fair, manly, and ingenuous; and let the critic be at least as guarded and exact in his statements as the author with whom he finds fault. A. S. PACKARD.

Providence, Oct. 30.

The teaching of natural history.

Two works intended for 'beginners' in zoölogy have been criticised in recent numbers of *Science*, — Packard's 'First lessons in zoölogy' and French's 'Butterflies of the eastern United States.' These criticisms have been in the line of the prevailing fashion, in that the one which begins with microscopic animals, and shows such parts as can be seen only by the aid of first-class objectives, manipulated by first-class microscopists, is highly commended; while the other, which takes up animals that can be seen, and treats of parts and changes that can be observed by any student with the naked eye, is utterly condemned.

As a teacher of many years' experience with beginners in zoölogy, I hope you will let me be heard, though my remarks are not at all in the fashion.

The critic of French's work begins by saying, "The whole aim of the author seems to be to enable his reader to find out the name of a specimen in hand; and to this end his analytical key is fairly good, so far as the perfect insect goes, excepting, that as no tables are given for genera, families, etc., it would not help the student if species not included in the book were to turn up." The 'whole aim,' etc. Only 25½ pages are devoted to the key, and the book contains over 400. 'To find out the name of a specimen.' This seems, in the eyes of the fashionable critic, an unpardonable sin. What does any one want the name for? I can but think that there are a few good reasons for knowing the name quite early in the progress of acquaintanceship with an animal or plant: 1°, it will enable the worker to read what is already known about it, and thus know whether he has discovered any thing new; 2°, if he has found out something new, he can tell or write the news, and say what he is talking or writing about; 3°, information fastened to something, be it only a name, can be kept in mind or in a note-book. The key analyzes only the 'perfect insect.' What work, either with or without a key, would enable one to determine either animals or plants at all stages? How would Coues's 'Key' or Gray's 'Manual' stand this test? For 'genera, families,' etc. The key does trace into the families, the genera, and the species; and all the families and genera are more or less fully characterized either in the key or in the body of the work. 'Species not included.' The book gives all the known species of the region: who could give the unknown ones?

I quote again from the critic. "Third, the whole aim of the author appears to be to enable the user to answer the question, 'What is the name of my butterfly?' — for pedagogical purposes, not even a worthy, far less the best end." Of course, he had said all this before, but the 'whole' is represented by the fraction $\frac{1}{16}$. The author does not make it a 'worthy' and 'best end,' but he does make it just what it is, a worthy and best beginning; and from this good beginning he goes on to tell of its different stages of growth through egg, larva, pupa, and perfect form; of its food; and of its seasonal changes; thus helping the pupil to become a true, original investigator by discovering new facts of growth and development.

A little later in the criticism, the book is said not to contain all that has been published about every species. The critic has twice said it didn't contain any thing but key. I know of no dozen works which together contain so many important facts as this one; and, on account of its size, the publisher probably had the author pay for the plates. I am thankful that he has been good enough to give this much for 'pedagogical purposes.'

The criticism is finally clinched by this remark, 'It is but the rehabilitation of the dry husks of a past generation.' If there are any dry husks in science, it is well illustrated by many of the late works for beginners in botany and zoölogy in which the classification and characterization of orders, families, etc., are given, from bacteria to a buttercup in the one, and to man in the other, — dry husks, 1°, because classification is ever changing; 2°, it is a classification of unknown things, and necessarily so, as nearly all students in schools live away from the sea, and have no chance to work with good microscopes, and more than half of classification pertains to marine and microscopic forms; 3°, such condensed classification as is possible in a 300-page book is so faulty as to be useless or worse. Take the other method for determining classification, i.e., by the use of a key. The pupil begins with something to classify, and as soon as he reaches the name of an order, family, etc., has an example to illustrate it. He knows what he is studying, and has determined by actual observation the arrangement and parts of its organs. He has been changed from a book-worm to an original observer.